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Kawamura

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(54) **ELECTRONIC COMPONENT ASSEMBLY STRUCTURE AND ELECTRONIC COMPONENT**

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B60R 16/023 (2006.01)
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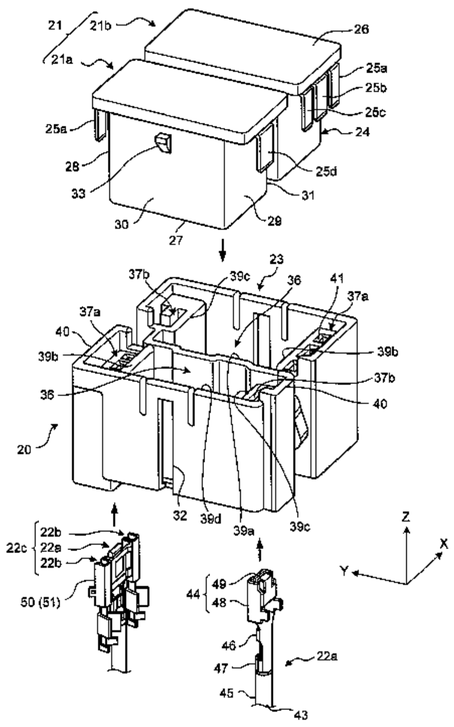
(57) **ABSTRACT**

An electronic component having plural lead terminals protruding from side surfaces of a component main body is inserted and accommodated in a housing member, and the lead terminals are brought into contact with plural terminal fittings held in the housing member to assemble the electronic component into the housing member. Each of the lead terminals includes a base end protruding from at least one side surface of the component main body and a contact portion connected to the base end to droop along the side surface. The component main body is provided with an insulating member which is located to contact or face the base ends from a side of an end surface of the component main body which is most distant from a bottom wall of the housing member in assembling the electronic component into the housing member. Accordingly, it is possible to suppress deformation of the lead terminals.

15 Claims, 10 Drawing Sheets



(51) **Int. Cl.**

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H05K 5/02	(2006.01)
H01H 50/04	(2006.01)
H01R 13/514	(2006.01)

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(58) **Field of Classification Search**
CPC H01R 9/24; H01R 13/518; H01R 13/113; H01R 13/4362; H01R 13/514; H02G 3/18; H05K 5/0247; H05K 5/0217; H05K 7/14; B60R 16/0238; B60R 16/0239
See application file for complete search history.

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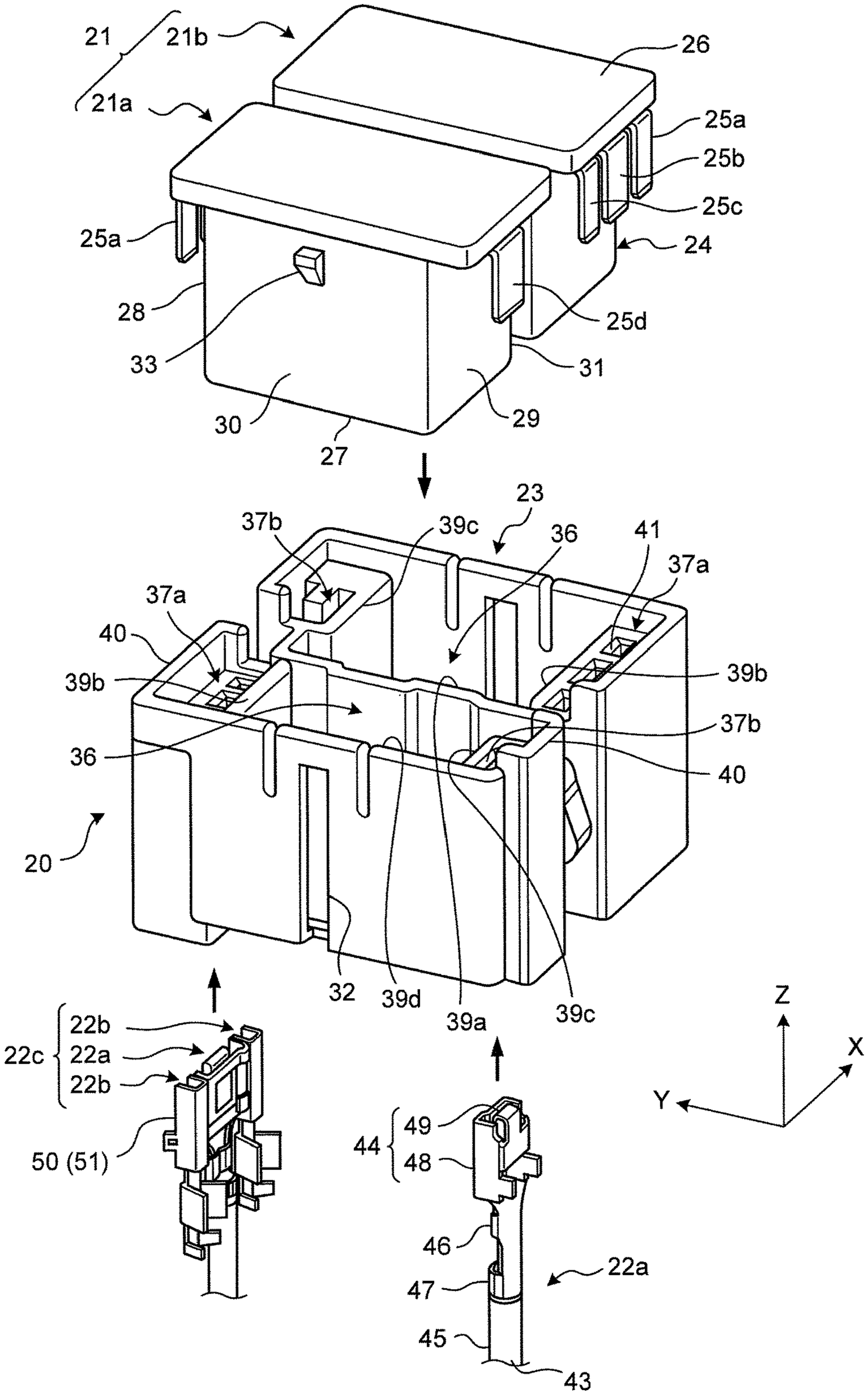
FIG.1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39c
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22a
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FIG.2

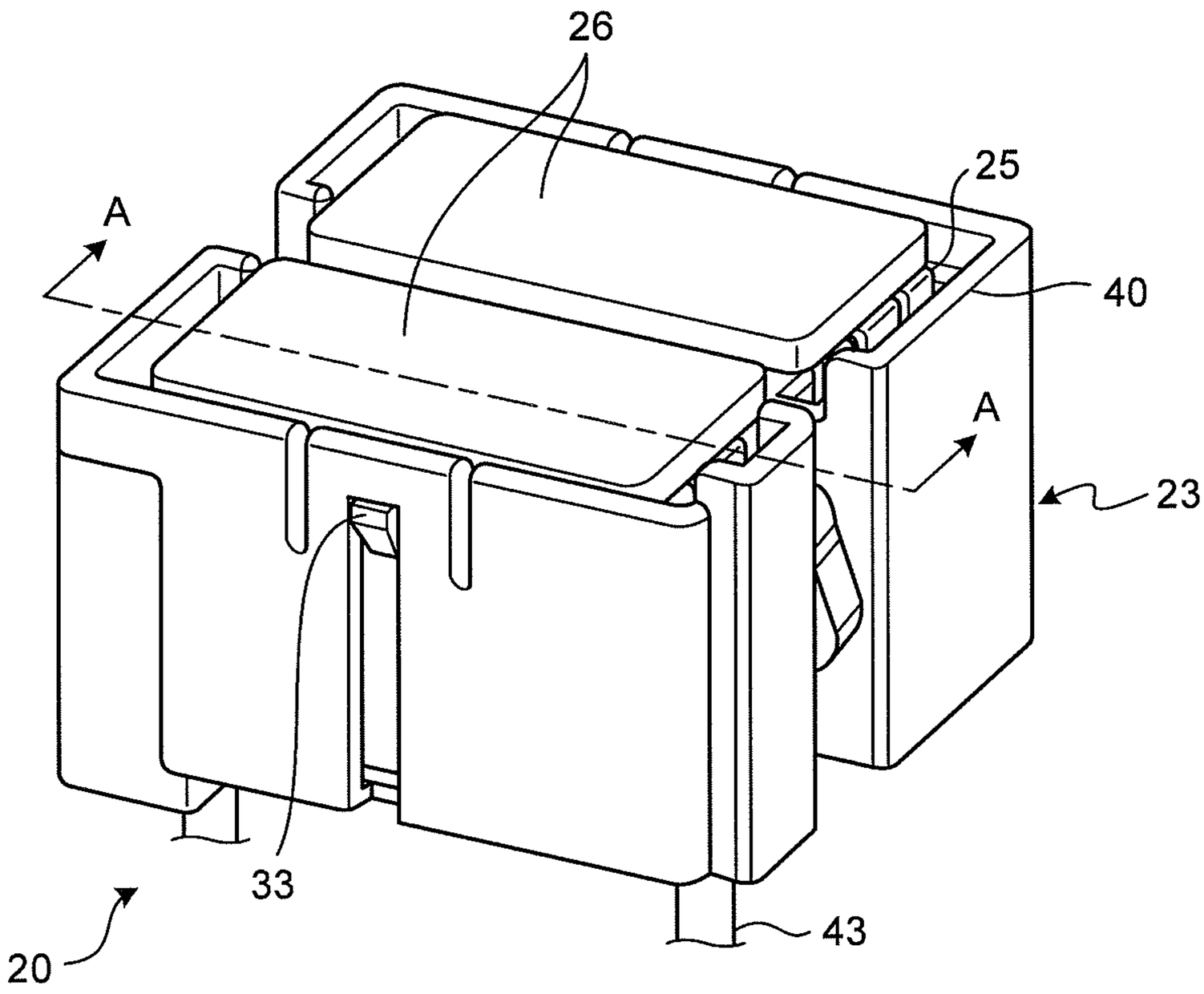
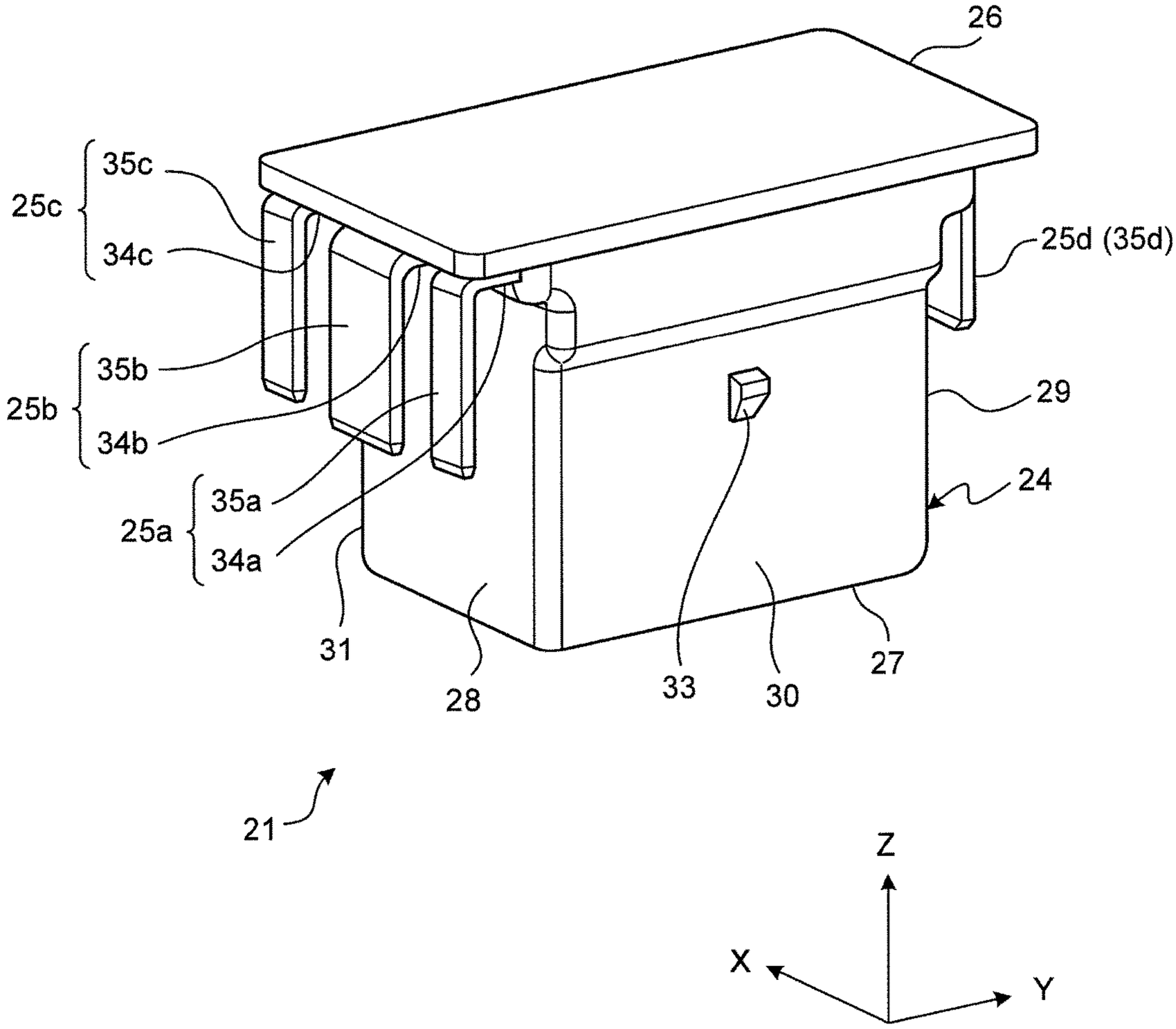


FIG.3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25d (35d)
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Z
X
Y

FIG.4

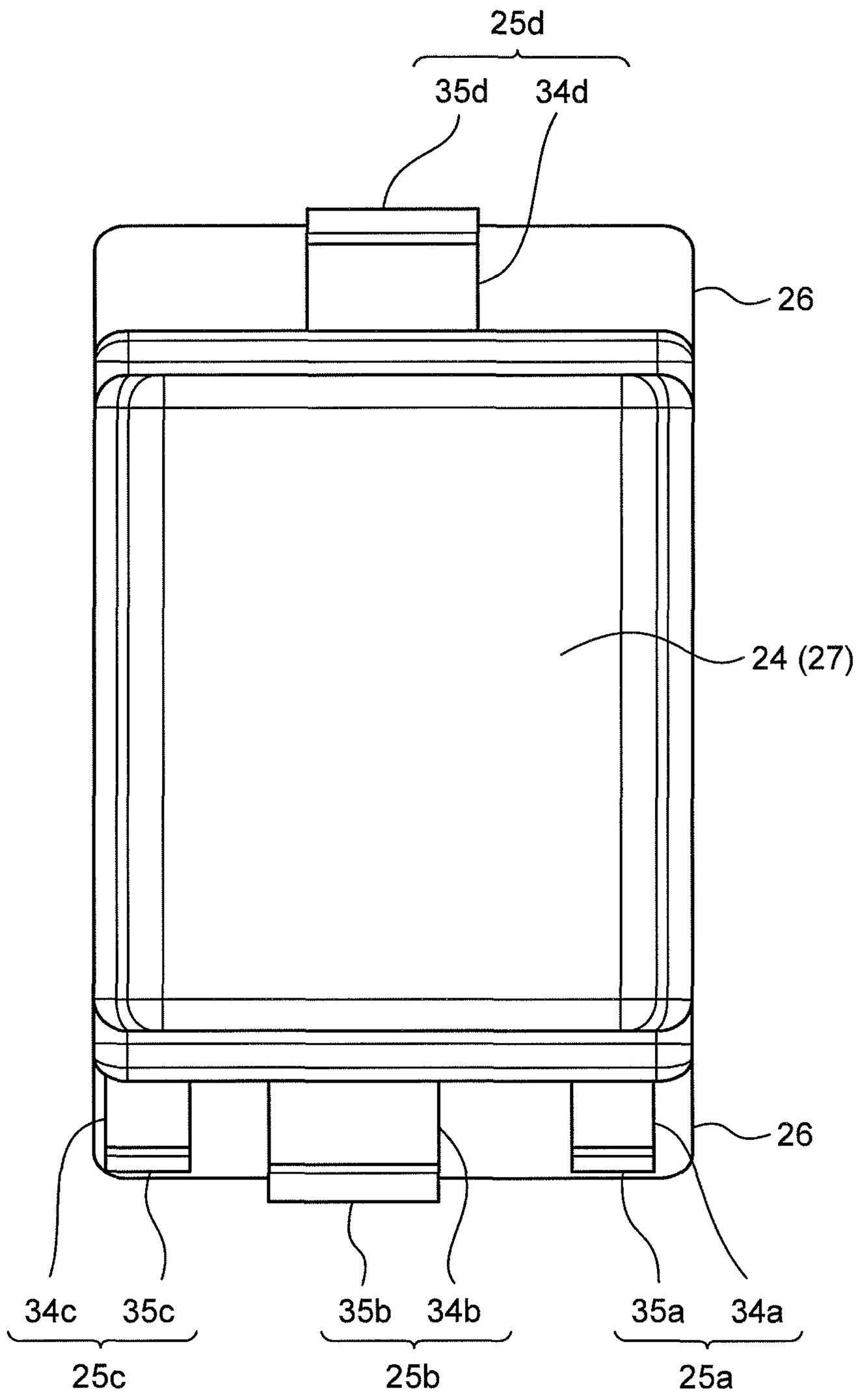


FIG.5

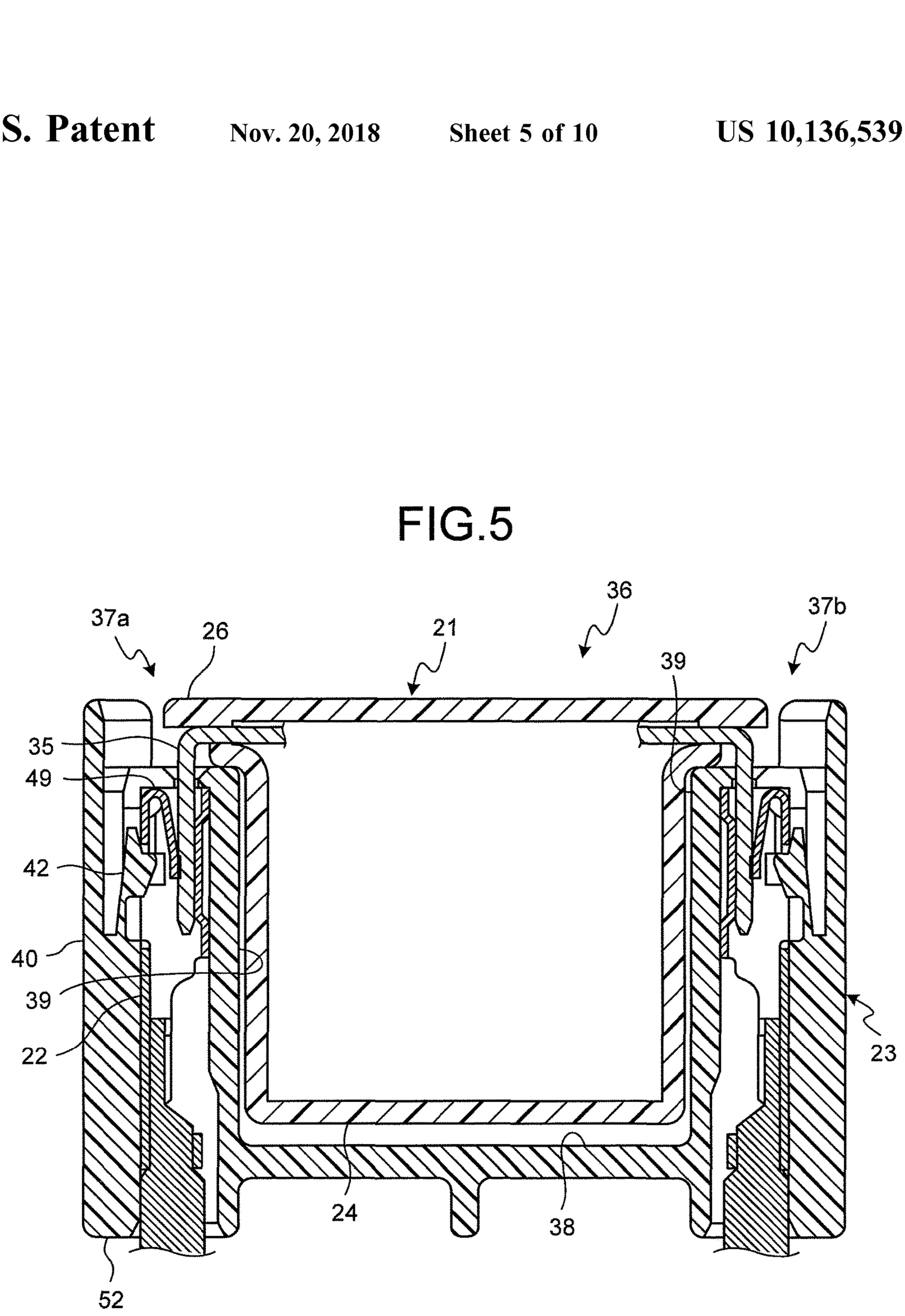


FIG.6

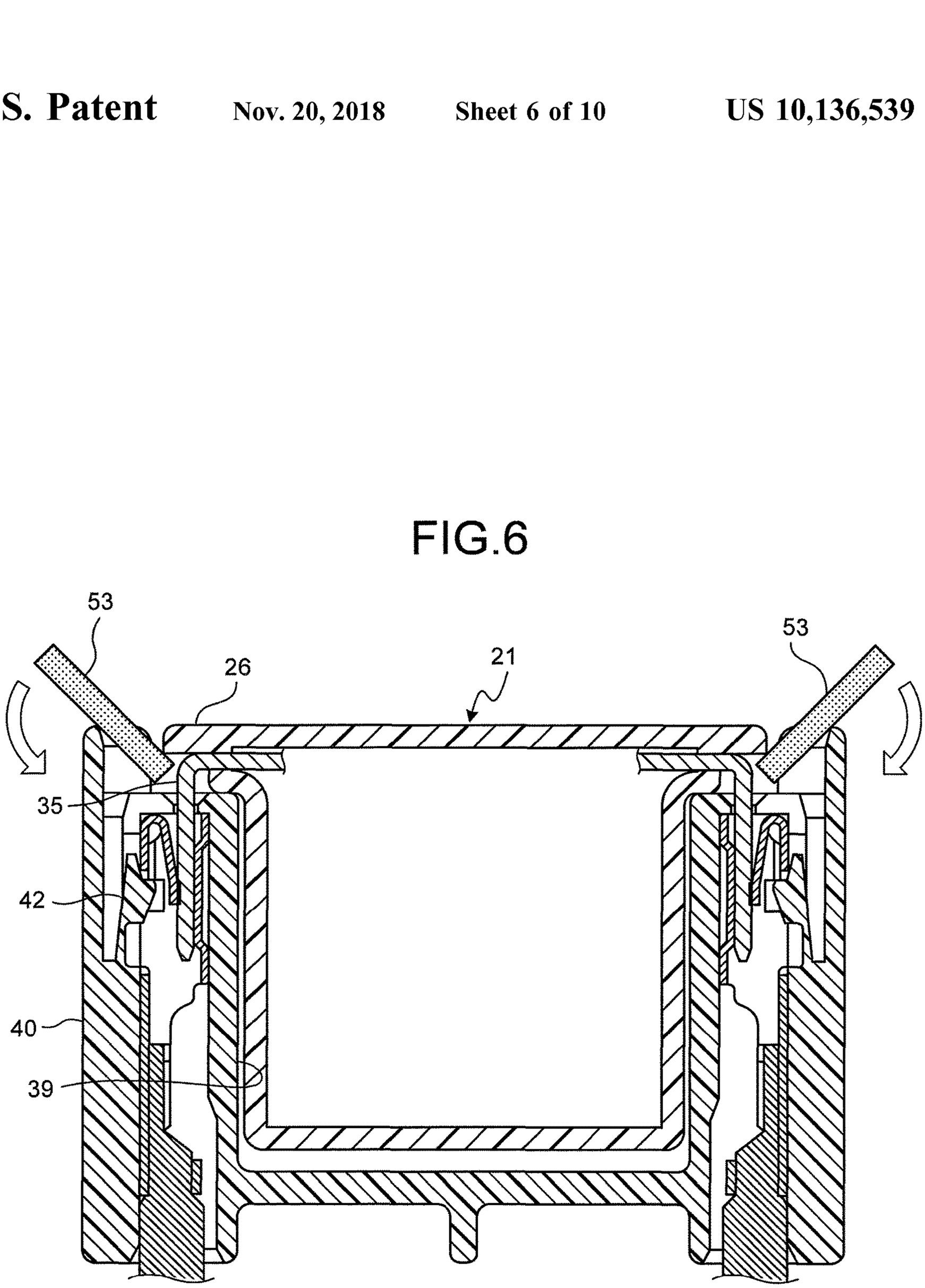


FIG.7

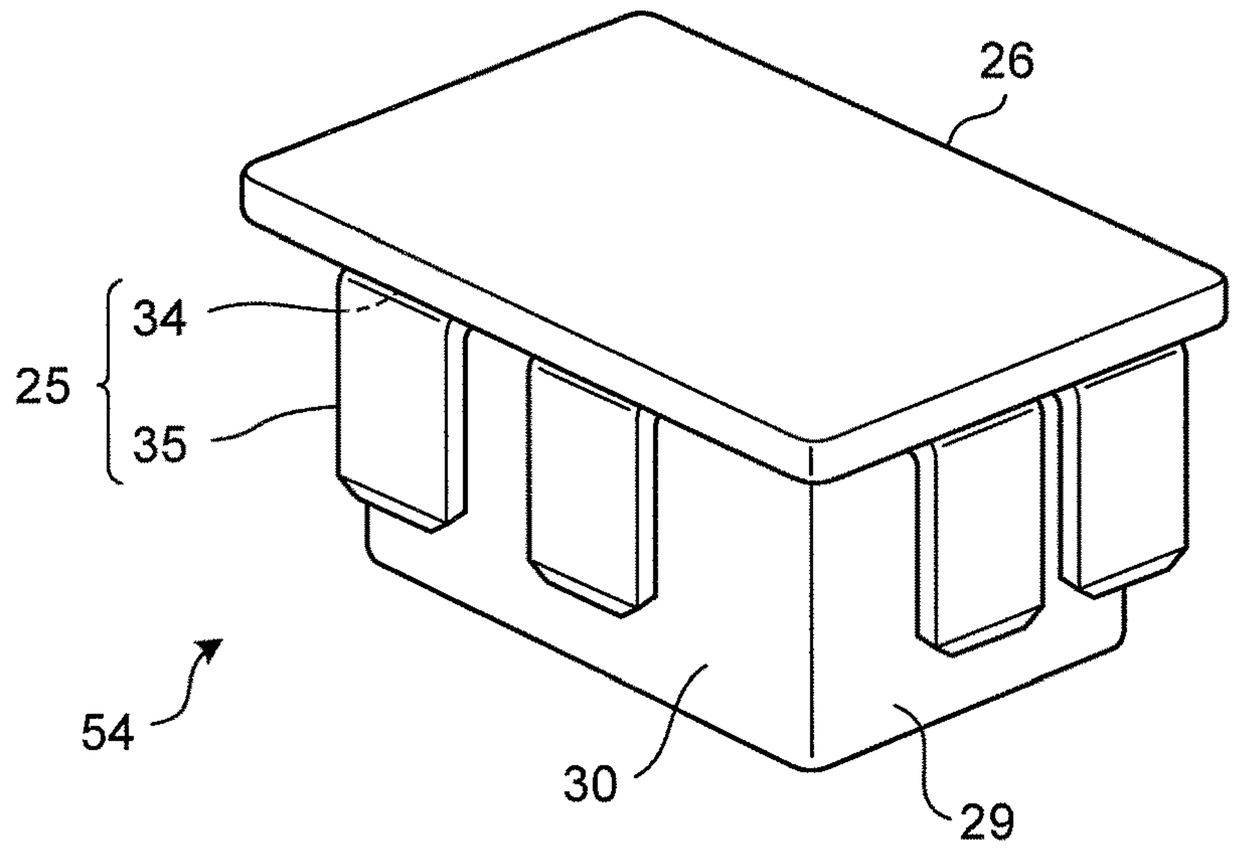


FIG.8

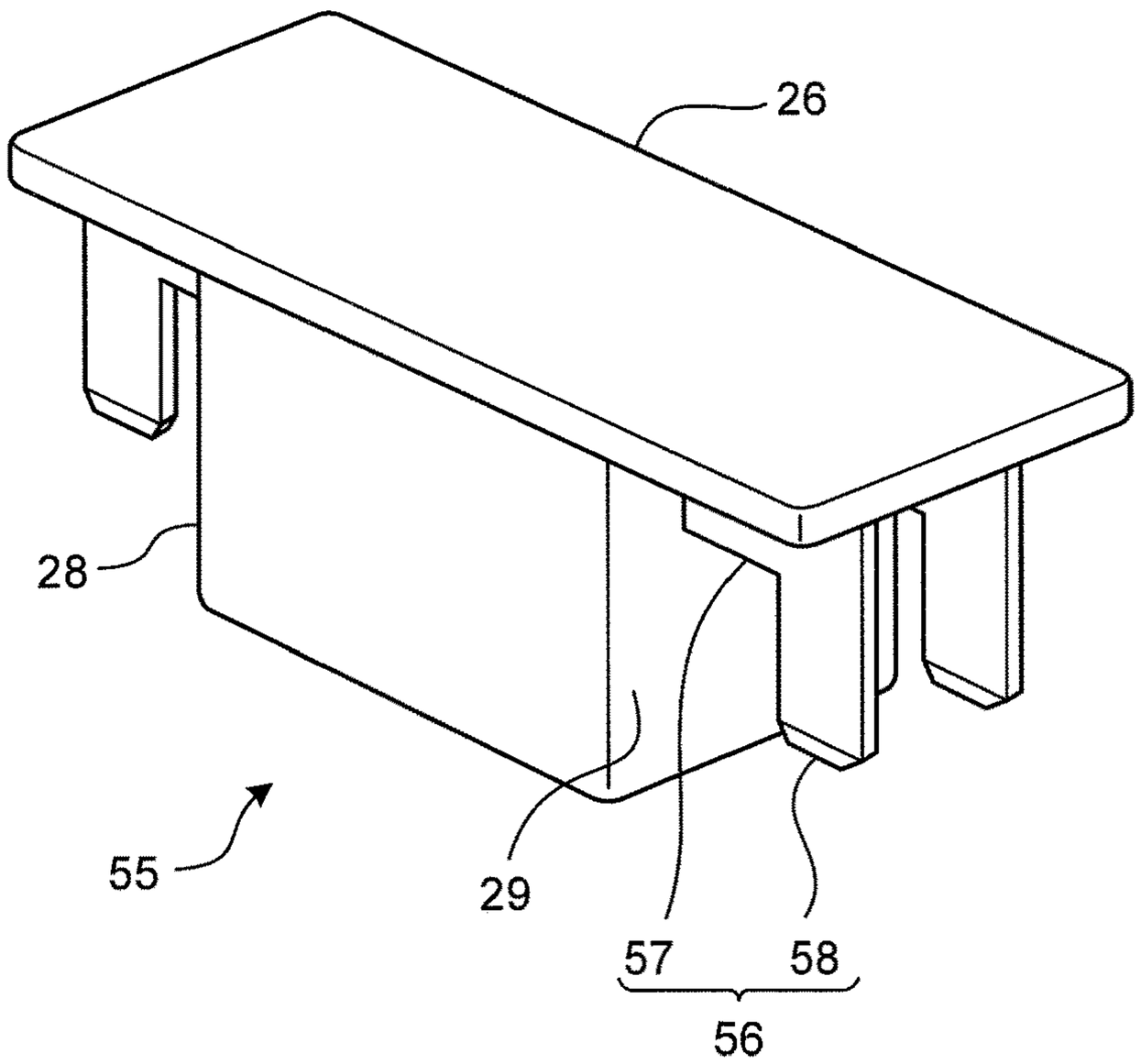


FIG.9

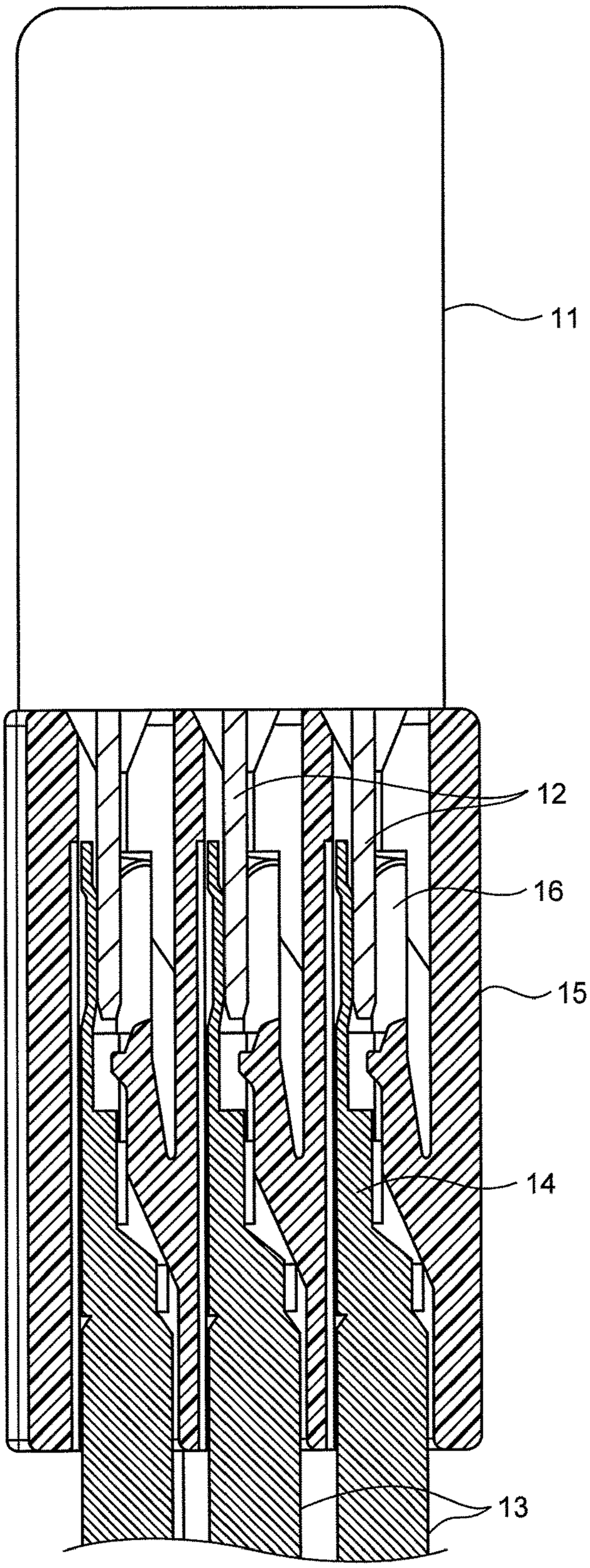


FIG.10

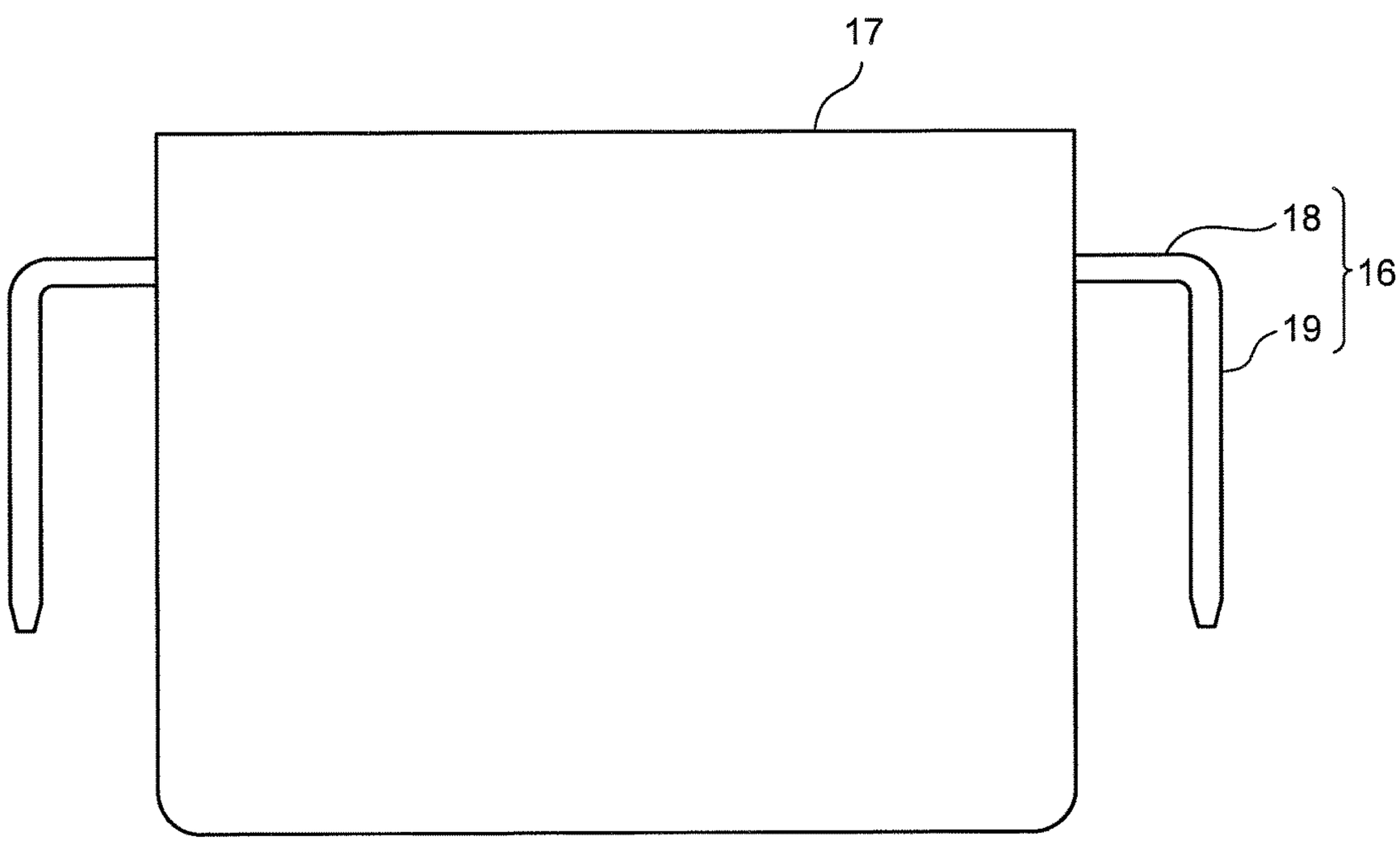


FIG.11A

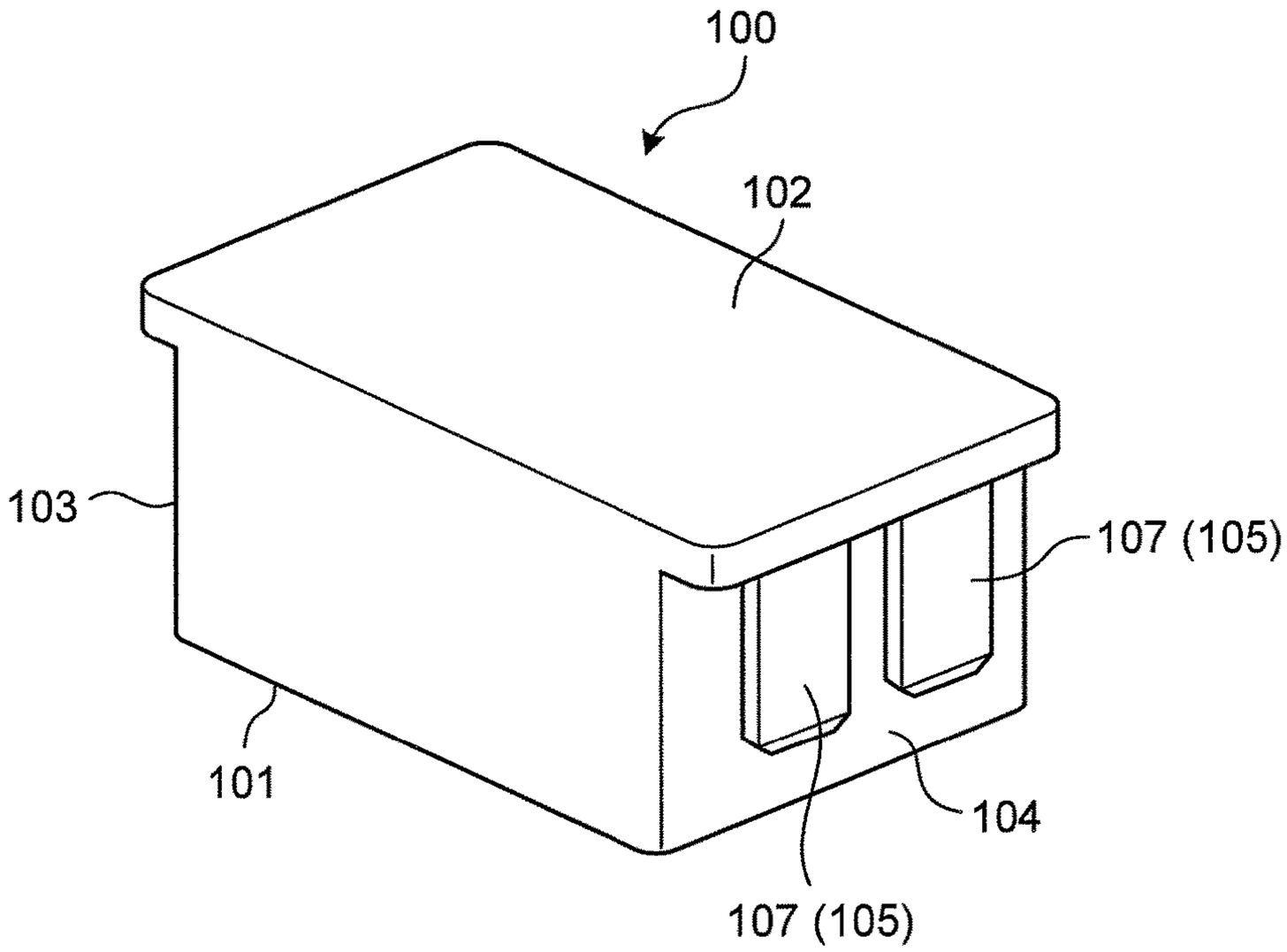
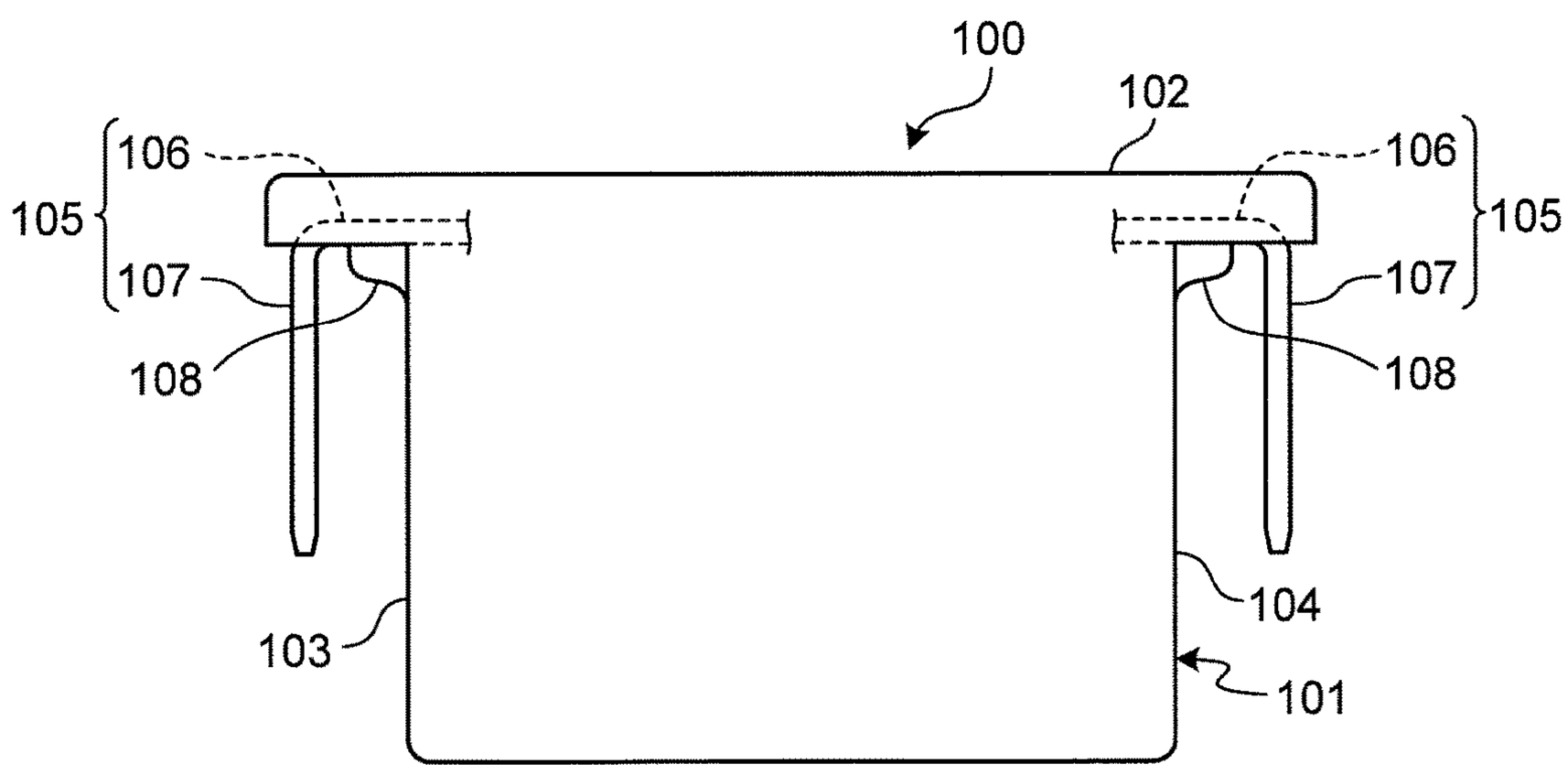


FIG.11B



ELECTRONIC COMPONENT ASSEMBLY STRUCTURE AND ELECTRONIC COMPONENT

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation application of International Application PCT/JP2014/056709, filed on Mar. 13, 2014, and designating the U.S., the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electronic component assembly structure and an electronic component, and more particularly, to an electronic component assembly structure provided to an electrical junction box which is mounted on a moving object such as an automobile.

2. Description of the Related Art

In general, a moving object such as an automobile is equipped with an electrical junction box in which an electronic component such as a relay is accommodated to control connection between a power supply device and an electric component (see Japanese Patent Application Laid-open No. 2010-221787).

FIG. **9** is a longitudinal-sectional view of a conventional relay module. As illustrated in FIG. **9**, a conventional relay includes a relay main body **11** formed in a rectangular parallelepiped shape and plural plate-like lead terminals **12** protruding in a straight line shape from one surface (bottom surface) of the relay main body **11**. Such a type of relay is assembled into a resinous holding member **15**, which holds terminal fittings **14** connected to electrical wires **13**, to constitute a relay module. The relay module is assembled into an electrical junction box. Each terminal fitting **14** is provided with a spring portion **16** to which the lead terminal **12** is fitted. The relay is held by the holding member **15** by inserting tips of the plural lead terminals **12** into the spring portions **16**. In FIG. **9**, the conventional relay module is basically illustrated in a longitudinal-sectional view but only the relay main body **11** is illustrated in a side view.

However, since such a type of relay module is assembled in a state in which the relay main body **11** is placed on an end surface (top surface) of the holding member **15**, for example, the height dimension (in the up-down direction in FIG. **9**) of the relay module increases.

Therefore, for example, as illustrated in FIG. **10**, it can be considered that each lead terminal **16** of a relay is bent and formed in an L shape. FIG. **10** is a side view illustrating an example of a relay. Each lead terminal **16** includes a base end **18** protruding from a side surface of a relay main body **17** having a rectangular parallelepiped shape and a contact portion **19** drooping along the side surface of the relay main body **17** from which the base end **18** protrudes. According to this configuration, since the relay main body **17** can be accommodated in an opened box-like housing member (not illustrated) by inserting the relay into the housing member and fitting the lead terminals **16** (contact portions **19**) to the terminal fittings held in the housing member, it is possible to reduce the height dimension of the relay module.

However, the relay illustrated in FIG. **10** is held in the housing member by fitting the tips of the lead terminals **16** (the contact portions **19**) to the terminal fittings and pressing the tips with the spring portions. Accordingly, in accommodating the relay in the housing member, the lead terminals **16**

are inserted into the spring portions against the spring force of the terminal fittings. Accordingly, in each lead terminal **16** having an L shape, a load (reaction force) in inserting the lead terminal into the terminal fitting is concentrated on a bent portion or the like and thus the lead terminal **16** may be deformed to the direction (to the upper side in FIG. **10**) opposite to the fitting direction. Here, the deformation of the lead terminal should be within an elastic limit range, but when the degree of deformation increases, the lead terminal **16** may be permanently deformed and, for example, a connection state to the terminal fitting or a holding force of the relay may be affected.

SUMMARY OF THE INVENTION

The present invention is made in consideration of the above-mentioned problems and an object thereof is to suppress deformation of a lead terminal.

In order to solve the above-mentioned problems, an electronic component assembly structure according to one aspect of the present invention includes an electronic component including a component main body having a rectangular parallelepiped shape, and a plurality of lead terminals protruding from side surfaces of the component main body; a housing member in which the electronic component is inserted and accommodated; and a plurality of terminal fittings which are held in the housing member and to which the lead terminals are fitted. Here, each of the lead terminals includes a base end protruding from at least one side surface of the component main body, and a contact portion connected to the base end to droop along the side surface. The component main body is provided with an insulating member which is located to contact or face the base ends from a side of an end surface of the component main body which is most distant from a bottom wall of the housing member when assembling the electronic component into the housing member. The electronic component is inserted and accommodated in the housing member, the plurality of lead terminals come in contact with the plurality of terminal fittings, respectively, and the electronic component is assembled into the housing member.

In this case, the insulating member is formed in a substantially rectangular plate shape in a plan view and is disposed along the end surface of the component main body.

Further, the insulating member partially or entirely covers the base ends in the protruding direction.

Further, the insulating member is a part which seals accommodated elements included in the component main body.

Further, in order to solve the above-mentioned problems, an electronic component according to the present invention includes a component main body having a rectangular parallelepiped shape; and a plurality of lead terminals protruding from the component main body. Here, each of the lead terminals includes a base end protruding from at least one side surface of the component main body, and a contact portion connected to the base end to droop along the side surface. The component main body is provided with an insulating member which is located to contact or face the base ends from a side of an end surface of the component main body which is most distant from a bottom wall of the housing member when assembling the component main body into the housing member.

In this case, the insulating member is formed in a substantially rectangular plate shape in a plan view and comes in contact with the base end and is disposed along the end surface of the component main body.

The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an assembly diagram of a relay module according to the present invention;

FIG. **2** is a diagram illustrating the entire configuration of the relay module according to the present invention;

FIG. **3** is a perspective view illustrating an appearance of a relay illustrated in FIG. **1**;

FIG. **4** is a plan view of the relay illustrated in FIG. **3** when viewed from the bottom side;

FIG. **5** is a cross-sectional view taken along arrow A-A of FIG. **2**;

FIG. **6** is a diagram illustrating a method of detaching the relay in FIG. **5**;

FIG. **7** is a perspective view illustrating a relay according to another embodiment of the present invention;

FIG. **8** is a perspective view illustrating a relay according to another embodiment of the present invention;

FIG. **9** is a longitudinal-sectional view of a conventional relay module;

FIG. **10** is a side view illustrating an example of the relay;

FIG. **11**A is a perspective view illustrating an appearance of a relay in which base ends of lead terminals are surrounded with a resin; and

FIG. **11**B is a side view of the relay illustrated in FIG. **11**A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, an electronic component assembly structure according to the present invention will be described with reference to the accompanying drawings. In this embodiment, a relay module in which a relay is used as an electronic component and the relay is accommodated in a housing member will be described, but the electronic component assembly structure according to the present invention can be applied to electronic components other than the relay.

The usage of the relay module according to this embodiment is not particularly limited, but a case can be considered in which the relay module is used for equipment or the like for controlling a connection state between a power supply device and an electric component in a moving object such as an automobile. Specifically, for example, it can be considered that the relay module is introduced into an electrical junction box (junction box) disposed between an electric component and a battery which are mounted on an automobile and is used as a relay module for controlling input and cutoff of power. Such a type of relay module may be integrally formed with the electrical junction box, but may be formed as an independent body.

FIG. **1** is an assembly diagram of a relay module **20** according to an embodiment. FIG. **2** is a diagram illustrating the entire configuration of the relay module **20** illustrated in FIG. **1**. FIG. **3** is a perspective view illustrating the entire configuration of a relay illustrated in FIG. **1**. FIG. **4** is a plan view of the relay when viewed from the bottom side. FIG. **5** is a cross-sectional view taken along arrow A-A of FIG. **2**. In the following description, a direction indicated by arrow X in FIG. **1** is defined as a front-back direction, a direction indicated by arrow Y is defined as a right-left direction, and a direction indicated by arrow Z is defined as an up-down direction (hereinafter, the same applies to FIG. **2**). However, the up-down direction, the right-left direction, and the front-back direction may not necessarily match the respective directions in a state in which the relay module **20** is actually mounted on a moving object. In FIGS. **5** and **6**, various components accommodated in a relay main body **24** are not illustrated.

As illustrated in FIG. **1**, the relay module **20** according to this embodiment has a configuration in which a relay **21**, terminal fittings **22**, and a housing member **23** are mutually assembled. In this embodiment, it is assumed that one relay module **20** includes two relays **21***a* and **21***b*. However, the number of relays constituting one relay module is not limited to two and the relay module may include only one relay or may include three or more relays. When the relay module includes plural relays, relays **21** having the configuration illustrated in FIG. **1** may be employed or relays having configurations (for example, FIGS. **7** and **8**) other than the configuration illustrated in FIG. **1** may be mixed as described later.

Each relay **21** includes the relay main body **24** which is a component main body having a rectangular parallelepiped shape and which is formed of a resin or the like, four plate-like lead terminals **25***a* to **25***d* which protrude from the relay main body **24**, and a plate-like insulating member **26** which is attached to the relay main body **24**. The relay main body **24** is a bottomed box-like container in which electronic components are accommodated, and the insulating member **26** is attached along the top surface of an opening edge not illustrated. The relays **21***a* and **21***b* have the same configuration but the right and left sides thereof are reversed. The detailed configuration of the insulating member **26** will be described later.

The relay main body **24** has a top surface not illustrated, a bottom surface **27** located below, a left side surface **28** and a right side surface **29** facing each other in the right-left direction, and a front surface **30** and a back surface **31** facing each other in the front-back direction, and the insulating member **26** is attached to the top surface. The relay main body **24** has a substantially rectangular parallelepiped shape which is long in the right-left direction, and four surfaces of the left side surface **28**, the right side surface **29**, the front surface **30**, and the back surface **31** are side surfaces. The front surface **30** is provided with a locking protrusion **33** which engages with a penetration groove **32** formed in the housing member **23**. The relay main body **24** according to this embodiment is formed in a rectangular parallelepiped shape, but may be formed in a square parallelepiped shape.

As illustrated in FIG. **3**, each of the lead terminals **25***a* to **25***d* includes a plate-like base end **34** (**34***a* to **34***d*) protruding from a side surface of the relay main body **24** and a plate-like contact portion **35** (**35***a* to **35***d*) connected to and extending from the base end **34**. The lead terminals **25***a* to **25***c* among lead terminals **25** include the base ends **34***a* to **34***c* perpendicularly protruding from the left side surface **28** of the relay main body **24** with a gap therebetween in the width direction (the front-back direction) of the relay main body **24** and contact portions **35***a* to **35***c* which are connected to the base ends **34***a* to **34***c* to droop along the left side surface **28** with a predetermined gap from the left side surface **28** of the relay main body **24**. On the other hand, the lead terminal **25***d* includes the base end **34***d* (FIG. **4**) perpendicularly protruding from the right side surface **29** of the relay main body **24** and the contact portions **35***d* which is connected to the base

end **34***d* to droop along the right side surface **29** with a predetermined gap from the right side surface **29** of the relay main body **24**.

The base ends **34***a* to **34***d* protrude in parallel to the top surface or the bottom surface **27**, and the protruding position is set to the same height position below the top surface. On the other hand, the contact portions **35***a* to **35***d* extend in parallel with the opposite side surfaces of the relay main body **24** and the distances thereof from the opposite side surfaces are set to the same. In the contact portions **35***a* to **35***d*, the height positions of the tips (lower ends) thereof are set to the same height position above the bottom surface **27** of the relay main body **24**. The widths in the front-back direction of the base ends **34***a* and **34***c* and the contact portions **35***a* and **35***c* of the lead terminals **25***a* and **25***c* are set to the same magnitude, and the widths in the front-back direction of the base ends **34***b* and **34***d* and the contact portions **35***b* and **35***d* of the lead terminals **25***b* and **25***d* are set to the same magnitude. The width in the front-back direction of the base ends **34***b* and **34***d* and the contact portions **35***b* and **35***d* of the lead terminals **25***b* and **25***d* are set to be greater than the width in the front-back direction of the base ends **34***a* and **34***c* and the contact portions **35***a* and **35***c* of the lead terminals **25***a* and **25***c*.

The housing member **23** is a resinous casing for accommodating and holding the relay **21** and the terminal fittings **22** and includes a first housing chamber **36** that guides and accommodates the relay main body **24** therein and a second housing chamber **37** (**37***a* and **37***b*) that accommodates and holds the terminal fittings **22** therein. In this embodiment, the housing member **23** is treated as a single member independent of an electrical junction box not illustrated. However, the housing member **23** may be formed as a part of a casing which is formed in the electrical junction box and may be formed as a unified body with the electrical junction box.

As illustrated in FIG. **1**, two first housing chambers **36** are formed in the housing member **23** according to this embodiment, and two second housing chambers **37***a* and **37***b* are arranged with each first housing chamber **36** interposed therebetween. The lead terminals **25***a* to **25***c* are accommodated in the second housing chamber **37***a*, the lead terminal **25***d* is accommodated in the second housing chamber **37***b*, and the terminal fittings **22** are held at predetermined positions to correspond to the lead terminals **25** inserted into the second housing chambers **37**.

As illustrated in FIG. **5**, the first housing chamber **36** is surrounded with a bottom wall **38** and wall portions **39** rising upright from the bottom wall **38** to form a concave space of which the top is opened to the outside. The wall portions **39** rise upright from the bottom wall **38** so as to surround the side surfaces (the left side surface **28**, the right side surface **29**, the front surface **30**, and the back surface **31**) of the relay main body **24** from four directions and guide and accommodate the relay main body **24** in the first housing chamber **36**. The first housing chamber **36** is formed in a rectangular parallelepiped shape which is slightly larger than the relay main body **24**, smoothly accommodates the relay main body **24** guided by the wall portions **39** therein, and holds the posture of the relay main body **24** by causing four side surfaces of the accommodated relay main body **24** to interfere with the wall portions **39**.

As illustrated in FIG. **1**, the penetration groove **32** directing the first housing chamber **36** to the outside of the housing member **23** is formed in a wall portion **39***d* (the wall portion facing the front surface **30** of the relay main body **24**) other than a wall portion **39***a* partitioning the neighboring first housing chambers **36** and wall portions **39***b* and **39***c* as partition walls from the second housing chambers **37** among the four wall portions **39** (**39***a* to **39***d*) forming the first housing chamber **36** so as to extend in the height direction of the wall portions **39**. The penetration groove **32** is configured to lock the locking protrusion **33** of the relay main body **24** when the relay main body **24** is accommodated in the first housing chamber **36**.

The second housing chambers **37***a* and **37***b* are disposed outside the wall portions **39***b* and **39***c* of the first housing chamber **36**, that is, on the opposite sides of the first housing chamber **36** with the wall portions **39***b* and **39***c* interposed therebetween, and are surrounded with a rectangular tubular frame formed by the wall portions **39***b* and **39***c* and a frame portion **40** of the housing member **23** to form a rectangular parallelepiped space of which the top portion and the bottom portion are opened to the outside. In the second housing chamber **37***a* disposed outside the wall portion **39***b* of the first housing chamber **36**, at least the vicinity of an opening into which the lead terminals **25** are inserted is partitioned by a partition wall **41** formed by the wall portion **39***b* and the frame portion **40**. The second housing chambers **37***a* and **37***b* are provided with lances **42** (locking pieces) at positions facing the terminal fittings **22** as illustrated in FIG. **5**. Each lance **42** serves to hold the corresponding terminal fitting **22** in the second housing chamber **37**, is integrally molded to extend in a cantilever shape from the frame portion **40** to the second housing chamber **37** so as to be elastically deformed.

The terminal fitting **22** is an interface member that is connected to a terminal portion of an electrical wire **43** so as to electrically connect the electrical wire **43** to the relay **21**. As illustrated in FIG. **1**, each terminal fitting **22** includes a first terminal fitting **22***a* and a second terminal fitting **22***b*. The terminal fittings **22***a* and **22***b* are formed by machining a conductive metal sheet.

The first terminal fitting **22***a* has the contact portions **35***b* and **35***d* fitted thereto and includes a female fitting portion **44** which supports the contact portion **35**, a pair of core clamping pieces **46** which caulk a core wire exposed by peeling an insulating coating **45** of the terminal portion of the electrical wire **43**, and a pair of external clamping pieces **47** which caulk a tip of the insulating coating **45** of the electrical wire **43**. The fitting portion **44** includes a tubular portion **48** having a rectangular tubular shape and having a space into which the contact portions **35***b* and **35***d* are inserted and a spring portion **49** which is formed by folding a plate-like member connected to a side plate forming the tubular portion **48** from the vicinity of the insertion hole of the tubular portion **48** to the space. The contact portions **35***b* and **35***d* are supported by the fitting portion **44** by pressing the contact portions **35***b* and **35***d* inserted into the space of the tubular portion **48** against another side plate facing the side plate with an elastic force of the spring portion **49**.

The second terminal fitting **22***b* serves to have the contact portions **35***a* and **35***c* fitted thereto and the structure for supporting the contact portions **35** is basically the same as the first terminal fitting **22***a*. Accordingly, a fitting portion **50** corresponding to the fitting portion **44** of the first terminal fitting **22***a* will be described below. The fitting portion **50** includes a tubular portion **51** having a space into which the contact portions **35***a* and **35***c* are inserted and a spring portion (not illustrated) disposed in the tubular portion **51**. The tubular portion **51** is formed to have a width smaller than that of the fitting portion **44** of the first terminal fitting **22***a*. That is, the fitting portion **50** supports the contact portions **35***a* and **35***c* by pressing the contact portions **35***a* and **35***c* inserted into the tubular portion **51** in a predeter-

mined direction using the spring portion. Both the terminal fittings **22***a* and **22***b* have a well-known terminal structure, and are not particularly limited as long as they can support the contact portion **35**. For example, a terminal fitting called a fastening type may be employed.

In this embodiment, as illustrated in FIG. **1**, the second terminal fittings **22***b* are accommodated on both sides of the first terminal fitting **22***a* in the second housing chamber **37***a*. The first terminal fitting **22***a* is accommodated in the second housing chamber **37***b*. The terminal fittings **22***a* and **22***b* are supported by the lances **42** in the second housing chamber **37**.

Each lance **42** forms a so-called spring mechanism, serves to press the lower edge of the spring portion **49** of the terminal fitting **22** with a restoration force from elastic deformation and to lock the lower edge, achieves fixation of the terminal fitting **22** to the second housing chamber **37**, and holds the terminal fitting **22** in the second housing chamber **37**. In this embodiment, the right and left lances **42** are arranged to be symmetric as illustrated in FIG. **5**, but the right and left lances **42** may be disposed to extend in the same direction, for example, one lance **42** may extend from the frame portion **40** and the other lance **42** may extend from the wall portion **39**.

For example, in order to accommodate the first terminal fitting **22***a* in the second housing chamber **37***b* and to hold the first terminal fitting using the lances **42**, the first terminal fitting **22***a* is inserted from an opening **52** (FIG. **5**) on the bottom of the second housing chamber **37***b*. Then, the first terminal fitting **22***a* is inserted into the second housing chamber **37***b* until the tip (fitting portion **44**) thereof comes in contact with the lance **42**. When an upward force (insertion force) is applied to the first terminal fitting **22***a* so as to further insert the first terminal fitting **22***a* into the second housing chamber **37***b* in this state, the lance **42** is pressed by the first terminal fitting **22***a* and is elastically deformed to approach the frame portion **40**. When an insertion force is applied to the first terminal fitting **22***a* against the restoration force from elastic deformation, the first terminal fitting **22***a* moves upward in a state in which the lance **42** comes in sliding contact with the fitting portion **44**. When the first terminal fitting **22***a* moves and the lance **42** relatively reaches the lower edge of the spring portion **49** along the fitting portion **44**, the lance **42** is elastically deformed and engages with the lower edge of the spring portion **49**. By causing the lance **42** to engage with the first terminal fitting **22***a* in this way, the first terminal fitting **22***a* is locked to the lance **42**. Accordingly, it is possible to prevent the first terminal fitting **22***a* from getting out of the second housing chamber **37***b*. That is, the first terminal fitting **22***a* is held in the second housing chamber **37***b*.

On the other hand, in this embodiment, the position in the up-down direction of the relay **21** in a state in which the relay **21** is accommodated in the housing member **23**, that is, when the contact portions **35** of the lead terminals **25** are fitted to the spring portions **49** of the terminal fittings **22** (the first terminal fittings **22***a*), is set to a predetermined height position such that the insulating member **26** does not protrude from the top of the housing member **23** as illustrated in FIG. **2**. Here, the height position of the insulating member **26** can be determined depending on the positions at which the contact portions **35** of the lead terminals **25** are fitted to the spring portions **49** of the terminal fittings **22**. That is, in the second housing chamber **37**, each terminal fitting **22** is held at the height position at which the spring portion **49** holding the contact portion **35** of the lead terminal **25** faces the side surface of the relay main body **24** accommodated in the first housing chamber **36** with the wall portion **39** interposed therebetween. The top end face of the wall portion **39** is disposed at a predetermined height position below the top end surface of the housing member **23** so as not to contact with the base end **34** of the lead terminal **25** when the contact portion **35** of the lead terminal **25** is fitted to the spring portion **49** of the terminal fitting **22**, and the bottom wall **38** is disposed at a predetermined height position not coming in contact with the bottom surface **27** of the relay main body **24**. Accordingly, except for the portions in which the contact portions **35** of the lead terminals **25** are fitted to the spring portions **49** of the terminal fittings **22**, the relay **21** is held in the housing member **23** without interfering with the bottom wall **38** or the top end face of the wall portion **39** in the height direction of the housing member **23**. Accordingly, it is possible to satisfactorily bring the lead terminals **25** into contact with the terminal fittings **22** and thus to stabilize a holding force of the relay **21** in the housing member **23**. In FIG. **5**, the top end face of the wall portion **39** comes in contact with a portion of the relay main body **24** having a level difference. In this case, it is also possible to stably hold the relay **21**.

When the relay **21** is assembled into the housing member **23** in this embodiment, the relay main body **24** is brought into contact with the wall portion **39** of the first housing chamber **36** to stabilize the posture thereof such that the relay **21** is not excessively inclined with respect to the first housing chamber **36**, the relay main body **24** is guided along the wall portion **39**, and is inserted into the first housing chamber **36**. When the vicinity of the lower end of the relay main body **24** is accommodated in the first housing chamber **36**, the tips (lower ends) of the contact portions **35** of the lead terminals **25** are positioned to face the fitting portions **44** above the terminal fittings **22**. When the relay main body **24** is inserted to the vicinity of the bottom wall **38** of the first housing chamber **36** in a state in which the contact portions **35** are positioned in this way, the contact portions **35** are inserted into the tubular portions **48** of the fitting portions **44** and the contact portions **35** are supported (fitted) with the pressing force of the spring portions **49**. In the relay module **20** assembled in this way, as illustrated in FIGS. **2** and **5**, the relay **21** is held in the housing member **23** and the relay **21** is electrically connected to the electrical wire **43** via the terminal fittings **22**.

As described above, the relay **21** is supported in the housing member **23** with the spring force when the contact portions **35** of the lead terminals **25** are fitted to the fitting portions **44** of the terminal fittings **22**. Accordingly, when the relay **21** is accommodated in the housing member **23**, the contact portions **35** need to be inserted into the fitting portions **44** against the spring force of the spring portions **49**. In this case, in each lead terminal **25** having an L shape as in this embodiment, a load (reaction force) in fitting the lead terminals into the fitting portions **44** is concentrated on a bent portion or the like and thus the lead terminals **25** may be deformed to the direction opposite to the fitting direction, that is, upward in FIG. **1**. The deformation should be within an elastic limit range, but when the degree of deformation increases, the lead terminals **25** may be permanently deformed and thus a connection state to the terminal fittings **22** or a holding force of the relay **21** may be affected.

From this point of view, the relay **21** according to this embodiment is characterized in that the relay main body **24** is provided with the insulating member **26**. The configuration of the insulating member **26** will be described below. The insulating member **26** is attached along the end surface (the top surface not illustrated) of the relay main body **24**.

The insulating member **26** is formed by molding using an insulating resin or the like, is formed in a substantially rectangular plate shape in a plan view as illustrated in FIGS. **3** and **4**, protrudes in a direction perpendicular to the side surfaces **28** to **31** of the relay main body **24**, is located above the base ends **34** of the lead terminals **25**, and is disposed to face the base ends **34**. The insulating member **26** in this embodiment comes in contact with the top surfaces of the base ends **34** of the lead terminals **25** and is disposed along the top surface of the base ends **34**. As illustrated in FIG. **4**, the insulating member **26** extends to the tips of the base ends **34** of the lead terminals **25** or the vicinities of the tips. In other words, the "position above the base ends **34** of the lead terminals **25**" at which the insulating member **26** is disposed can be typically said to be a position on the side of the end surface of the relay main body **24** which is most distant from the bottom wall **38** of the housing member **23** (the first housing chamber **36**) in assembling the relay **21** into the housing member **23** as illustrated in FIG. **5** and the like.

According to this configuration, the base ends **34** of the lead terminals **25** can be supported from the upper side using the insulating member **26**. Accordingly, since a stress (reaction force) acting on the lead terminals **25** in inserting the lead terminals **25** into the terminal fittings **22** can be applied to the insulating member **26**, it is possible to prevent deformation of the lead terminals **25**. As a result, since the connection state between the lead terminals **25** and the terminal fittings **22** can be maintained good, it is possible to maintain the electrical connection state between the lead terminals **25** and the terminal fittings **22** good and to prevent a decrease in the holding force of the relay **21** in the housing member **23**.

In this embodiment, the insulating member **26** is disposed to come in contact with the base ends **34** of the lead terminals **25**, but may be disposed to be separated from the top end surfaces of the base ends **34**. In this case, the distance by which the insulating member **26** is separated from the top end surfaces of the base ends **34** is limited to a range in which the deformation of the lead terminals **25** can be elastically restored when the lead terminals **25** are inserted into the terminal fittings **22**.

FIG. **6** is a diagram illustrating a method of detaching the relay in FIG. **5**. As illustrated in FIG. **5**, the size in the in-plane direction of the insulating member **26** in this embodiment is set so as to form a gap from the inner circumferential surface of the frame portion **40** of the housing member **23** in a state in which the relay **21** is accommodated in the housing member **23**. Accordingly, in detaching the relay **21** from the housing member **23**, as illustrated in FIG. **6**, the relay **21** can be simply detached, for example, by hooking tips of plural rod-like tools **53** to positions of the insulating member **26** not interfering with the lead terminals **25** but protruding from the side surfaces of the relay main body **24** and causing the tools **53** to fall in the arrow direction about the top end of the frame portion **40**.

Since the insulating member **26** in this embodiment is formed to come in contact with the top surface of the base ends **34** of the lead terminals **25**, the top surfaces of the base ends **34** are covered with the insulating member **26**, but other surfaces such as front and rear side surfaces of the base ends **34** are exposed. Accordingly, the insulating member **26** may be formed to partially or entirely cover the base ends **34** in the longitudinal direction (protruding direction). That is, the top and bottom surfaces and the side surfaces of the base ends **34** are covered with the insulating member **26** along the longitudinal direction. The insulating member **26** can be formed, for example, by insert-molding the lead terminals **25**. According to this configuration, it is possible to prevent an electric shock due to contact of a finger with the lead terminals **25**. It is also possible to prevent a short circuit between the lead terminals **25** due to contact of a conductor such as a tool with the neighboring lead terminals **25**.

The insulating member **26** in this embodiment is a part sealing the relay main body **24** which is formed in a box shape and in which electronic components are accommodated. That is, the insulating member **26** is attached to the end face (top surface) of an edge of an opening of the relay main body **24** and serves as a lid sealing the inside of the relay main body **24**. In this way, when a part of a member sealing the relay main body **24** is used as the insulating member **26**, it is not necessary to form a new member as the insulating member. Accordingly, it is possible to prevent an increase in the number of components of the relay **21** and to prevent an increase in thickness of the relay **21** due to attachment of a new member to the relay main body **24** or an increase in size of the relay module due thereto.

An electronic component having a shape different from the relay **21** illustrated in FIG. **1** will be described below. In the above-mentioned embodiment, the relay module **20** into which the relay **21** illustrated in FIG. **1** is assembled is described as an example of the electronic component assembly structure according to the present invention, but the configuration of the electronic component is not limited to this example. For example, as long as an electronic component includes a component main body having a rectangular parallelepiped shape (which includes a square parallelepiped shape) and lead terminals protruding from side surfaces of the component main body, each lead terminal includes a base end protruding from at least one side surface of the component main body and a contact portion connected to the base end to droop along the side surface with a gap from the side surface of the component main body, and the component main body is provided with an insulating member located to face the base end above the base end, the same advantages as the relay **21** illustrated in FIG. **1** can be achieved, for example, from electronic components (for example, relays) having the following shapes. In the following description, differences from the relay **21** illustrated in FIG. **1** will be mainly mentioned.

FIG. **7** is a perspective view illustrating a relay according to another embodiment of the present invention. In the relay **21** illustrated in FIG. **1**, each of a pair of parallel side surfaces of the relay main body **24** is provided with the lead terminals **25**, but two neighboring side surfaces **29** and **30** may be provided with the lead terminals **25** like a relay **54** illustrated in FIG. **7**. Here, the insulating member **26** is a rectangular plate member which is located to face the base ends **34** of the lead terminals **25** from the upper side, similarly to FIG. **1**. In this case, in the housing member **23** accommodating the relay **54**, the second housing chamber **37** is formed at two positions adjacent to the first housing chamber **36** to correspond to the arrangement of the lead terminals **25** and the second housing chambers are arranged to be perpendicular to each other. In each second housing chamber **37**, the terminal fittings **22** corresponding to the number of lead terminals **25** inserted into the second housing chamber are held to correspond to the lead terminals **25**.

In the relay **54** illustrated in FIG. **7**, each of two neighboring side surfaces of the relay main body **24** is provided with two lead terminals **25**, but the number of lead terminals **25** formed on the side surfaces may be equal to or different from each other. The lengths in the width direction of the lead terminals **25** formed on the side surfaces are particularly limited. The number of side surfaces of the relay main

body **24** provided with the lead terminals **25** is not limited to two, but may be one or may be three or more. In this case, the second housing chamber **37** can be formed at one or more positions adjacent to the first housing chamber **36** to correspond to the arrangement of the lead terminals **25**.

FIG. **8** is a perspective view illustrating a relay according to another embodiment of the present invention. In the above-mentioned relays, the thickness direction of the contact portions **35** of the lead terminals **25** intersects (is perpendicular to) the side surfaces of the relay main body **24** facing the contact portions **35**, but lead terminals **56** may be formed such that the thickness direction thereof is parallel to the side surfaces of the relay main body **24** like a relay **55** illustrated in FIG. **8**. In the relay **55** illustrated in FIG. **8**, base ends **57** and contact portions **58** of the lead terminals **56** are formed in a plate shape extending to be parallel to the front surface **30** and the back surface **31** of the relay main body **24**, the thickness direction of the contact portions **58** of two lead terminals **56** formed on one side surface **28** is parallel to the left side surface **28** of the relay main body **24**, and the thickness direction of the contact portions **58** of the two lead terminals **56** formed on the other side surface **29** is parallel to the right side surface **29** of the relay main body **24**. As in other relays, each base end **57** protrudes perpendicularly from the corresponding side surface of the relay main body **24** and each contact portion **58** extends in parallel with the corresponding side surface of the relay main body **24** with a gap from the side surface. As in other relays, the insulating member **26** is also formed along the top surfaces of the base ends **57** of the lead terminals **56**. In this case, in the housing member **23** accommodating the relay **55**, the second housing chamber **37** is formed at two positions adjacent to the first housing chamber **36** to correspond to the arrangement of the lead terminals **56**, and the second housing chambers **37** are arranged to be parallel with each other. In each of the second housing chambers **37**, the terminal fittings **22** corresponding to the number of lead terminals **56** are arranged in the direction of the lead terminals **56** to correspond to the lead terminals **56** inserted in the second housing chambers.

In the above-mentioned relays, the base ends of the lead terminals are completely exposed, but at least a part of each base end may be covered with a resin. FIG. **11**A is a perspective view illustrating an appearance of a relay in which base ends of lead terminals are covered with a resin and FIG. **11**B is a side view of the relay illustrated in FIG. **11**A.

As illustrated in FIGS. **11**A and **11**B, a plate-like insulating member **102** is attached to a relay **100** along one surface (for example, the top surface not illustrated) of a relay main body **101**, like the relay **21** according to the above-mentioned embodiment. The insulating member **102** is formed in a substantially rectangular shape in a plan view by molding an insulating resin or the like. The insulating member **102** extends in a direction perpendicular to a pair of side surfaces **103** and **104** of the relay main body **101** which are disposed to face each other. Each of the side surfaces **103** and **104** is provided with two lead terminals **105**. The lead terminals **105** are disposed such that contact portions **107** thereof face the side surfaces **103** and **104**. The insulating member **102** is formed to cover base ends **106** of the lead terminals **105**.

As illustrated in FIG. **11**B, the base ends **106** of the lead terminal **105** are covered with the insulating member **102** in the axial direction thereof and the contact portions **107** of the lead terminals **105** are disposed to protrude from the bottom surface of the insulating member **102**. Protrusions **108** are formed to have a level difference at positions at which the insulating member **102** and the side surfaces **103** and **104** intersect each other. The protrusions **108** come in contact with the top end face of the wall portion at the time of assembly of the relay **100** into the housing member. The base ends **106** of the lead terminals **105** may be disposed to protrude from the protrusions **108** or may be disposed to protrude from the side surfaces **103** and **104** of the relay main body **101**.

According to this configuration, the base ends **106** of the lead terminals **105** can be supported from the upper side by the insulating member **102**. Accordingly, since a load applied to the lead terminals **105** at the time of insertion of the lead terminals **105** into the terminal fittings can be greatly reduced, it is possible to prevent deformation of the lead terminals **105**. As a result, it is possible to keep the electrical connection state between the lead terminals **105** and the terminal fittings good and to prevent a decrease in the holding force of the relay **100** to the housing member. By covering the base ends **106** of the lead terminals **105** with the insulating member **102**, it is possible to prevent short-circuit between neighboring lead terminals **105**.

According to this configuration, since a stress (reaction force) acting on the lead terminals in bringing the lead terminals into contact with the terminal fittings is applied to the insulating member, it is possible to suppress deformation of the lead terminals. Accordingly, since the connection state between the lead terminals and the terminal fittings can be maintained good, it is possible to enhance reliability of the relay.

According to this configuration, since the insulating member is disposed to protrude from the component main body along the base ends of the lead terminals, the electronic component accommodated in the housing member can be simply detached from the housing member by hooking a rod-like tool to the insulating member and causing the tool to fall about a top end of an external wall of the housing member or the like.

According to this configuration, it is possible to prevent an electric shock due to contact of a finger with the lead terminals and to prevent a short circuit between the lead terminals due to contact of a conductor such as the tool with the neighboring lead terminals.

According to this configuration, since it is not necessary to newly provides a plate-like member as the insulating member, it is possible to prevent an increase in the number of components. It is also possible to suppress an increase in size of an electronic component or a module accompanying with an increase in thickness of the electronic component due to attachment of a plate-like member to an end surface of the component main body.

According to the present invention, it is possible to prevent deformation of a lead terminal.

While the embodiments of the present invention have been described in detail with reference to the drawings, the above-mentioned embodiments are only examples of the present invention and the present invention is not limited to the embodiments. Therefore, modifications in design or the like without departing from the gist of the present invention are included in the scope of the present invention.

For example, this embodiment describes an example in which the insulating member **26** formed independently of the relay main body **24** is attached along the end surface of the relay main body **24**, but the insulating member may be formed integrally with the relay main body **24**. In this case, the insulating member **26** is formed to protrude from the side surfaces of the relay main body **24**. This embodiment describes that the insulating member **26** is formed over the entire end surface of the relay main body **24** along the end

surface thereof, but the insulating member is not limited to this example as long as the insulating member is formed above the base ends **34** and **57** of the lead terminals **25** and **56** to face each other. In this case, for example, plural insulating members **26** formed in a plate shape are disposed to face the base ends **34** and **57** of the lead terminals **25** and **56**.

For example, the embodiments have described the relay module using a relay as an electronic component, but the electronic component is not limited to the relay. The embodiments may be applied to other electronic components as long as they include a component main body and lead terminals having configurations and appearance similar to the relay main body and the lead terminals according to the embodiments. Specifically, the embodiments may be applied to, for example, a control module or a fuse in which components such as an electronic circuit board are accommodated in a resinous case.

What is claimed is:

1. An electronic component assembly structure comprising:

an electronic component including a component main body having a rectangular parallelepiped shape, a plurality of lead terminals protruding from side surfaces of the component main body, and an insulating member;

a housing member in which the component main body is inserted and accommodated by surrounding four side walls of the component main body with wall portions of the housing member; and

a plurality of terminal fittings which are held in the housing member and to which the lead terminals are fitted, wherein:

each of the lead terminals includes a base end protruding from at least one side surface of the component main body, and a contact portion connected to the base end to droop along the side surface,

the insulating member is attached to the component main body, and the insulating member contacts or faces the base ends from a side of an end surface of the component main body which is most distant from a bottom wall of the housing member when assembling the electronic component into the housing member, and

the component main body and the insulating member are inserted into and accommodated in the housing member, the plurality of lead terminals positioned at an outer side of the wall portions of the housing member come in contact with the plurality of terminal fittings, respectively, and the electronic component is assembled into the housing member.

2. The electronic component assembly structure according to claim **1**, wherein

the insulating member is formed in a substantially rectangular plate shape in a plan view and is disposed along the end surface of the component main body.

3. The electronic component assembly structure according to claim **1**, wherein

the insulating member partially or entirely covers the base ends in the protruding direction.

4. The electronic component assembly structure according to claim **2**, wherein

the insulating member partially or entirely covers the base ends in the protruding direction.

5. The electronic component assembly structure according to claim **1**, wherein

the insulating member is a part which seals accommodated elements included in the component main body.

6. The electronic component assembly structure according to claim **2**, wherein

the insulating member is a part which seals accommodated elements included in the component main body.

7. An electronic component comprising:

a component main body having a rectangular parallelepiped shape;

a plurality of lead terminals protruding from the component main body, and

an insulating member, wherein:

each of the lead terminals includes a base end protruding from at least one side surface of the component main body, and a contact portion connected to the base end to droop along the side surface, and

the insulating member is attached to the component main body,

when assembling the component main body into a housing member, the insulating member contacts or faces the base ends from a side of an end surface of the component main body which is most distant from a bottom wall of a housing member,

the component main body and the insulating member are inserted into and accommodated in the housing member,

four side walls of the component main body are surrounded by wall portions of the housing member, and

the plurality of lead terminals are positioned at an outer side of the wall portions of the housing member.

8. The electronic component according to claim **7**, wherein

the insulating member is formed in a substantially rectangular plate shape in a plan view and comes in contact with the base end and is disposed along the end surface of the component main body.

9. The electronic component assembly structure according to claim **1**, wherein the insulating member is spaced apart from the housing member in an extending direction of the base end of each of the lead terminals.

10. The electronic component according to claim **7**, wherein the insulating member is spaced apart from the housing member in an extending direction of the base end of each of the lead terminals.

11. The electronic component assembly structure according to claim **1**, wherein the component main body and the insulating member are completely inserted into and accommodated in the housing member.

12. The electronic component according to claim **7**, wherein the component main body and the insulating member are completely inserted into and accommodated in the housing member.

13. The electronic component assembly structure according to claim **1**, wherein the housing member is a resinous casing for accommodating and holding the electronic component and the terminal fittings, and includes a first housing chamber that guides and accommodates the component main body therein and a second housing chamber that accommodates and holds the terminal fittings therein.

14. The electronic component assembly structure according to claim **1**, wherein the plurality of terminal fittings are inserted into the housing member in a first direction, and the lead terminals is fitted into the plurality of terminal fittings in a second direction parallel with the first direction.

15. The electronic component according to claim **7**, wherein the plurality of lead terminals protrude from the component main body at opposite lateral ends of the component main body, and, when assembling the component main body into a housing member, the opposite lateral ends

of the component main body and the insulating member are inserted into and accommodated in the housing member.

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